An Operational Configuration of the ARPS Data Analysis System to Initialize WRF in the NWS Environmental Modeling System

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The Weather Research and Forecasting (WRF) model is the next generation community mesoscale model designed to enhance collaboration between the research and operational sectors. The NWS as a whole has begun a transition toward WRF as the mesoscale model of choice to use as a tool in making local forecasts. Currently, both the National Weather Service in Melbourne, FL (NWS MLB) and the Spaceflight Meteorology Group (SMG) are running the Advanced Regional Prediction System (ARPS) Data Analysis System (ADAS) every 15 minutes over the Florida peninsula to produce high-resolution diagnostics supporting their daily operations. In addition, the NWS MLB and SMG have used ADAS to provide initial conditions for short-range forecasts from the ARPS numerical weather prediction (NWP) model. Both NWS MLB and SMG have derived great benefit from the maturity of ADAS, and would like to use ADAS for providing initial conditions to WRF. In order to assist in this WRF transition effort, the Applied Meteorology Unit (AMU) was tasked to configure and implement an operational version of WRF that uses output from ADAS for the model initial conditions.

Both agencies asked the AMU to develop a framework that allows the ADAS initial conditions to be incorporated into the WRF Environmental Modeling System (EMS) software. Developed by the NWS Science Operations Officer (SOO) Science and Training Resource Center (STRC), the EMS is a complete, full physics, NWP package that incorporates dynamical cores from both the National Center for Atmospheric Research's Advanced Research WRF (ARW) and the National Centers for Environmental Prediction's Non-Hydrostatic Mesoscale Model (NMM) into a single end-to-end forecasting system. The EMS performs nearly all pre- and post-processing and can be run automatically to obtain external grid data for WRF boundary conditions, run the model, and convert the data into a format that can be readily viewed within the Advanced Weather Interactive Processing System. The EMS has also incorporated the WRF Standard Initialization (SI) graphical user interface (GUI), which allows the user to set up the domain, dynamical core, resolution, etc., with ease. In addition to the SI GUI, the EMS contains a number of configuration files with extensive documentation to help the user select the appropriate input parameters for model physics schemes, integration timesteps, etc. Therefore, because of its streamlined capability, it is quite advantageous to configure ADAS to provide initial condition data to the EMS software.

One of the biggest potential benefits of configuring ADAS for ingest into the EMS is that the analyses could be used to initialize either the ARW or NMM. Currently, the ARPS/ADAS software has a conversion routine only for the ARW dynamical core. However, since the NMM runs about 2.5 times faster than the ARW, it is quite advantageous to be able to run an ADAS/NMM configuration operationally due to the increased efficiency.

To accomplish the goals set forth, the AMU first obtained the WRF EMS software from the NWS SOO STRC, installed the software, and ran a benchmark simulation prior to running with near real-time data. Next, the AMU configured a set of shell scripts to generate a 0-hour initialization file for the ADAS/ARW and write this initialization file to a pressure-coordinate file in the GRIB data format, which is the standard input data format for both the ARW and NMM. This method facilitates the initialization of the NMM dynamical core within the WRF-EMS using ADAS analyses. Additional details and some sample operational results from NWS MLB and SMG will be presented at the conference.